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(54) LIGHT EMISSION ELEMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a light emission element which has high luminous efficiency, high brightness and excellent color purity.

SOLUTION: Concerning the element emitting light by electrical energy in which a luminescence substance exists between a positive electrode and a negative electrode, the element includes an organic phosphor having a 3-substitution benzene skeleton substituted by a hydrocarbon aromatic series condensation ring including three or more ring structures.

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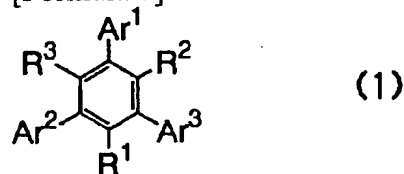
CLAIMS

[Claim(s)]

[Claim 1] The light emitting device characterized by including the organic fluorescent substance which has the 3 permutation benzene frame permuted with the hydrocarbon aromatic series condensed ring with which it is the component which photogene exists between a positive electrode and a negative electrode, and emits light with electrical energy, and this component includes three or more ring structures.

[Claim 2] The light emitting device according to claim 1 characterized by expressing with the following general formula (1) the organic fluorescent substance which has a 3 permutation benzene frame.

[Formula 1]



(R1-R3 are chosen here from hydrogen, an alkyl group, a cycloalkyl radical, an aralkyl radical, an alkenyl radical, a cyclo alkenyl radical, an alkynyl group, a hydroxyl group, a sulfhydryl group, an alkoxy group, an alkylthio group, an aryl ether group, an aryl thioether radical, an aryl group, a heterocycle radical, a halogen, haloalkane, a halo alkene, a halo alkyne, a cyano group, an aldehyde group, a carbonyl group, a carboxyl group an ester group, a carbamoyl group, the amino group, a nitro group, a silyl radical, and a siloxanyl radical, respectively.) Ar1-Ar3 are chosen from the perylene radicals of the pyrene radical of the anthracene radical of the phenanthrene radical of the fluorene radical of the terphenyl radical of no permuting or a permutation, no permuting, or a permutation, no permuting, or a permutation, no permuting, or a permutation, no permuting, or a permutation, no permuting, or a permutation, no permuting, or a permutation, respectively.

[Claim 3] The light emitting device according to claim 1 characterized by this organic fluorescent substance being luminescent material.

[Claim 4] The light emitting device according to claim 1 characterized by this organic fluorescent substance being an electronic transportation ingredient.

[Claim 5] The light emitting device according to claim 1 characterized by being the display displayed with a matrix and/or a segment method.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention is the component which can change electrical energy into light, and relates to an available light emitting device at fields, such as a display device, a flat-panel display, a back light, lighting, an interior, an indicator, a signboard, an electrophotography machine, and a lightwave signal generator.

[0002]

[Description of the Prior Art] Research of the organic laminating thin film light emitting device of emitting light in case it recombines within the electron poured in from cathode and the organic fluorescent substance with which the electron hole poured in from the anode plate was inserted into two poles is done actively in recent years. A thin shape, high brightness luminescence under low driver voltage, and multicolor luminescence by choosing a fluorescence ingredient are the descriptions, and this component attracts attention.

[0003] Since, as for this research, C.W.Tang and others of KODAKKU showed that an organic laminating thin film emitted light in high brightness (913 Appl.Phys.Lett. 51 (12) 21 p. 1987), many research facilities are inquiring. The typical configuration of the organic laminating thin film light emitting device which the research consortium of KODAKKU presented prepared Mg:Ag one by one on the ITO glass substrate as the diamine compound of electron hole transportability, the 8-hydroxy kino RINARU minium which is a luminous layer, and cathode, and green luminescence of 1000 cd/m² was possible for it at about [10V] driver voltage. The current organic laminating thin film light emitting device has followed the configuration of KODAKKU fundamentally, although there are some which are changing configurations, such as what has prepared the electronic transportation layer other than the above-mentioned component component.

[0004] A luminous layer consists of only host ingredients, or dopes a guest ingredient into a host ingredient, and is constituted. luminescent material -- three-primary-colors **** -- although things are called for, research of green luminescent material is progressing most until now. In red luminescent material and blue luminescent material, as for current, research is wholeheartedly made aiming at the improvement in a property. That from which good luminescence of color purity is obtained by high brightness especially in blue luminescent material is desired.

[0005] As a host ingredient, the metal complex of quinolinol derivatives including the above-mentioned tris (8-quinolinolato) aluminum, a benzoxazole derivative, a stilbene derivative, a bends thiazole derivative, a thiadiazole derivative, a thiophene derivative, a tetra-phenyl butadiene derivative, a cyclopentadiene derivative, an OKISA diazole derivative, an OKISA diazole derivative metal complex, a bends azole derivative metal complex, etc. are raised.

[0006] In a blue luminescence host ingredient, although the metal complex (JP,5-214332,A) which combined a different ligand from a quinolinol derivative as an example from which the comparatively good engine performance is obtained, a bis-styryl benzene derivative (JP,4-117485,A), etc. are raised, especially color purity is not enough.

[0007] On the other hand, fused aromatic ring derivatives, such as coumarin derivatives including the 7-dimethylamino-4-methyl coumarin by which it is known that it is useful as laser coloring matter, perylene, a pyrene, and an anthracene, a stilbene derivative, an oligo phenylene derivative, the furan derivative, the quinolone derivative, the oxazole derivative, the OKISA diazole derivative, etc. are known by the dopant ingredient as a guest ingredient.

[0008]

[Problem(s) to be Solved by the Invention] However, the luminescent material (a host ingredient, dopant ingredient)

used for the conventional technique had many things with low luminous efficiency which have high power consumption, and short things of a component life which have low endurance. Moreover, although red and green and blue three-primary-colors luminescence are called for as a full color display, in red and blue luminescence, there are few to which luminescence wavelength is satisfied and there is little what has color purity wide the width of face of a luminescence peak and good. What is excellent in endurance and shows sufficient brightness and a color purity property in blue luminescence especially is needed.

[0009] This invention solves the problem of this conventional technique, and luminous efficiency is high and it aims at offering the light emitting device which was excellent in high brightness at color purity.

[0010]

[Means for Solving the Problem] This invention is a component which photogene exists between a positive electrode and a negative electrode, and emits light with electrical energy, and is a light emitting device characterized by including the organic fluorescent substance which has the 3 permutation benzene frame permuted with the hydrocarbon aromatic series condensed ring with which this component includes three or more ring structures.

[0011]

[Embodiment of the Invention] Although it is not limited [conductive polymers /, such as inorganic conductivity matter, such as metals, such as conductive metallic oxide, such as tin oxide, indium oxide, and a tin oxide indium (ITO), or gold, silver, and chromium, copper iodide, and copper sulfide, the poly thiophene, polypyrrole, and the poly aniline, / especially] if transparent since a positive electrode takes out light in this invention, especially the thing for which ITO glass and Nesa glass are used is desirable. Although it is not limited since resistance of a transparent electrode just supplies sufficient current for luminescence of a component, from a viewpoint of the power consumption of a component, it is desirable that it is low resistance. For example, since supply of the substrate of 10ohms / ** extent is also attained, especially the thing for which a low resistance article is used is desirable [if it is an ITO substrate below 300ohms / **, it will function as a component electrode, but] current. Although the thickness of ITO can be chosen as arbitration according to resistance, it is usually used among 100-300nm in many cases. Moreover, since a glass substrate should just have sufficient thickness to use soda lime glass, alkali free glass, etc., and for thickness also maintain a mechanical strength, it is enough if there is 0.5mm or more. although alkali free glass is more desirable since the direction with little elution ion from glass is good about the quality of the material of glass -- SiO₂ etc. -- since the soda lime glass which gave barrier coating sealant is also marketed, this can be used. Especially as for the ITO film formation approach, the electron ray beam method, the sputtering method, a chemical reaction method, etc. do not receive a limit.

[0012] the matter with which cathode can pour an electron into this organic layer efficiently in this invention -- be -- although be limit especially, and platinum, gold, silver, copper, iron, tin, zinc, aluminum, an indium, chromium, a lithium, sodium, a potassium, calcium, magnesium, etc. be generally raise, in order to gather electron injection effectiveness and to raise a component property, the alloy containing a lithium, sodium, a potassium, calcium, magnesium, or these low work function metal be effective. However, it is not limited to these from it being common for these low work function metals to be unstable in atmospheric air generally, for example, use of mineral salt like lithium fluoride being especially possible although the approach of doping the lithium and magnesium (it being 1nm or less by the thickness gage display of vacuum deposition) of a minute amount to an organic layer, and using an extremely stable electrode can mention as a desirable example. Furthermore, it is mentioned as an example with desirable carrying out the laminating of inorganic substances, such as an alloy which used metals, such as platinum, gold, silver, copper, iron, tin, aluminum, and an indium, or these metals for electrode protection and a silica, a titania, and silicon nitride, polyvinyl alcohol, a vinyl chloride, the hydrocarbon system macromolecule, etc. It will not be restricted especially if the method of producing these electrodes can also take flows, such as resistance heating, an electron ray beam, sputtering, ion plating, and coating.

[0013] in this invention, photogene may be any of the gestalt which boiled further 1 electron-hole transportation layer / luminous layer, 2 electron-hole transportation layer / luminous layer / electronic transportation layer, 3 luminous layers / electronic transportation layer, 4 electron-hole transportation layer / luminous layer / electron hole blocking layer, 5 electron-hole transportation layer / luminous layer / electron hole blocking layer / electronic transportation layer, 6 luminous layers / electron hole blocking layer / electronic transportation layer, and the combination matter more than seven, and was mixed. That is, it is also good to prepare further the layer which contains the luminescent-

material independent or the luminescent material, electron hole transportation ingredient, and electronic transportation ingredient other than the multilayer laminated structure of the above 1-6 like 7 as a component configuration. Furthermore, although the photogene in this invention helps what emits light itself, and its luminescence, it corresponds to all, and it points out a compound, a layer, etc. which are participating in luminescence.

[0014] this invention -- setting -- an electron hole transportation layer -- the electron hole transportability matter -- independent or two or more kinds of matter -- a laminating -- it mixes or is formed with the mixture of the electron hole transportability matter and a macromolecule binder. It is required to convey the electron hole from a positive electrode efficiently in inter-electrode [which was able to give electric field as electron hole transportability matter], hole-injection effectiveness is high, and it is desirable to convey the poured-in electron hole efficiently. For that purpose, ionization potential is small, moreover hole mobility is large, it excels in stability further, and to be the matter which the impurity used as a trap cannot generate easily at the time of manufacture and use is demanded. As matter which fulfills such conditions, although not limited especially N and N' - diphenyl-N and N' - JI (3-methylphenyl) -4 and 4' - diphenyl -1 and 1' - diamine -- N and N' - dinaphthyl-N and N' - diphenyl -4 and 4' - diphenyl -1 and 1' -- triphenylamines, such as - diamine, -- A screw (N-allyl compound carbazole) or screws (N-alkyl carbazole) A pyrazoline derivative, a stilbene system compound, a hydrazone system compound, an OKISA diazole derivative and a phthalocyanine derivative, The heterocyclic compound represented by the porphyrin derivative, the polycarbonate and styrene derivative which have said monomer in a side chain by the polymer system, Although a polyvinyl carbazole, polysilane, etc. are desirable, a thin film required for component production is formed, and an electron hole can be poured in from a positive electrode, and it will not be limited especially if it is the compound which can convey an electron hole further.

[0015] The luminescent material in this invention may be any also in the combination of a host ingredient and host ingredient and a dopant ingredient. Moreover, the dopant ingredient may be contained in the whole host ingredient, may be contained partially, or may be any. The laminating may be carried out, it may distribute, or dopant ingredients may be any.

[0016] In this invention, luminescent material contains the organic fluorescent substance which has the 3 permutation benzene frame permuted with the hydrocarbon aromatic series condensed ring including three or more ring structures. It is the structure where a hydrocarbon aromatic series condensed-ring part has fluorescence, and is connected by the benzene frame. The conjugation length of a fluorescence spectrum and a molecule has correlation, and when the ring structure of the hydrocarbon aromatic series condensed ring is small, conjugation length will also be short and will have the fluorescence spectrum of an ultraviolet region. In order for the fluorescence spectrum of the hydrocarbon aromatic series condensed ring to be in a visible region, it is required to include three or more ring structures.

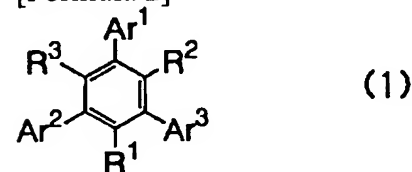
[0017] Although not limited especially as the hydrocarbon aromatic series condensed ring including three or more ring structures, aromatic series condensed-ring derivatives, such as aliphatic series aromatic series condensed-ring derivatives, such as PARAFENIREN derivatives, such as terphenyl, quarter phenyl, KINKI phenyl, and sexy phenyl, a fluorene, biphenylene, a dihydroanthracene, dibenzo SUBERAN, TORAKISEN, and TORIPUCHISEN, an anthracene, phenanthrene, a pyrene, perylene, fluoranthene, a chrysene, and coronene, etc. are raised. Especially, terphenyl, a fluorene, phenanthrene, an anthracene, a pyrene, and perylene are desirable.

[0018] Although especially the permutation location of 3 permutation benzene is not limited, 1 from a composite ease etc. and the 3 or 5th place are desirable.

[0019] The organic fluorescent substance which has a 3 permutation benzene frame is specifically expressed with the following general formula (1).

[0020]

[Formula 2]



[0021] R1-R3 are chosen here from hydrogen, an alkyl group, a cycloalkyl radical, an aralkyl radical, an alkenyl

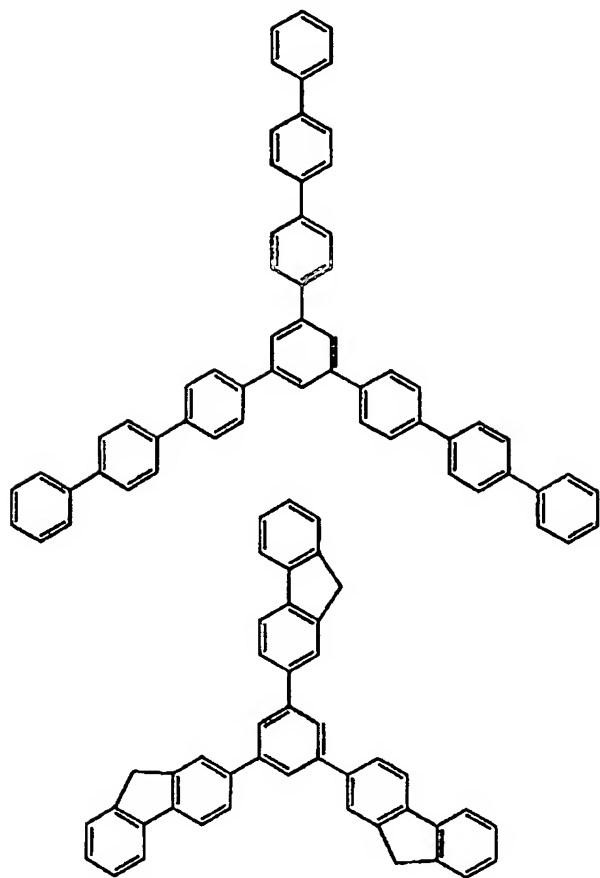
radical, a cyclo alkenyl radical, an alkynyl group, a hydroxyl group, a sulfhydryl group, an alkoxy group, an alkylthio group, an aryl ether group, an aryl thioether radical, an aryl group, a heterocycle radical, a halogen, haloalkane, a halo alkene, a halo alkyne, a cyano group, an aldehyde group, a carbonyl group, a carboxyl group, an ester group, a carbamoyl group, the amino group, a nitro group, a silyl radical, and a siloxanyl radical, respectively. Ar1-Ar3 are chosen from the perylene radicals of the pyrene radical of the anthracene radical of the phenanthrene radical of the fluorene radical of the terphenyl radical of no permuting or a permutation, no permuting, or a permutation, no permuting, or a permutation, no permuting, or a permutation, no permuting, or a permutation, respectively.

[0022] An alkyl group shows saturated-aliphatic-hydrocarbon radicals, such as a methyl group, an ethyl group, a propyl group, and butyl, among these substituents, and even if this is permuted also in no permuting, it is not cared about. Moreover, a cycloalkyl radical shows saturation alicyclic hydrocarbon radicals, such as for example, cyclo propyl, cyclohexyl, norbornyl, and adamantyl, and even if this is permuted also in no permuting, it is not cared about. Moreover, an aralkyl radical shows the aromatic hydrocarbon radical through aliphatic hydrocarbon, such as benzyl and a phenylethyl radical, and even if each of aliphatic hydrocarbon and aromatic hydrocarbon is permuted also in no permuting, it is not cared about. Moreover, an alkenyl radical shows a partial saturation aliphatic hydrocarbon radical including double bonds, such as a vinyl group, an allyl group, and a swine dienyl radical, and even if this is permuted also in no permuting, it is not cared about. Moreover, a cyclo alkenyl radical shows a partial saturation alicyclic hydrocarbon radical including double bonds, such as for example, a cyclo pentenyl radical, a cyclopentadienyl group, and a cyclohexene radical, and even if this is permuted also in no permuting, it is not cared about. Moreover, an alkynyl group shows a partial saturation aliphatic hydrocarbon radical including triple bonds, such as for example, an acetylenyl radical, and even if this is permuted also in no permuting, it is not cared about. Moreover, an alkoxy group shows the aliphatic hydrocarbon radical through ether linkage, such as a methoxy group, and even if the aliphatic hydrocarbon radical is permuted also in no permuting, it is not cared about. Moreover, the oxygen atom of the ether linkage of an alkoxy group is permuted by the alkylthio group by the sulfur atom. Moreover, an aryl ether group shows the aromatic hydrocarbon radical through ether linkage, such as a phenoxy group, and even if the aromatic hydrocarbon radical is permuted also in no permuting, it is not cared about. Moreover, the oxygen atom of the ether linkage of an aryl ether group is permuted by the aryl thioether radical by the sulfur atom. Moreover, an aryl group shows aromatic hydrocarbon radicals, such as a phenyl group, a naphthyl group, a biphenyl radical, a phenan tolyl group, a terphenyl radical, and a pyrenyl radical, and even if this is permuted also in no permuting, it is not cared about. Moreover, a heterocycle radical shows the cyclic structure radical which has atoms other than carbon, such as for example, a furil radical, a thienyl group, an oxazolyl radical, a pyridyl radical, a quinolyl radical, and a carbazolyl radical, and even if this is permuted also in no permuting, it is not cared about. A halogen shows a fluorine, chlorine, a bromine, and iodine. A part or all of the above-mentioned alkyl groups, such as for example, a trifluoromethyl radical, an alkenyl radical, and an alkynyl group shows what was permuted with the above-mentioned halogen, and even if haloalkane, the halo alkene, and the halo alkyne are permuted also in no permuting, they do not care about the remaining part. Including what was permuted by an aldehyde group, the carbonyl group, the ester group, the carbamoyl group, and the amino group by aliphatic hydrocarbon, alicyclic hydrocarbon, aromatic hydrocarbon, heterocycle, etc., further, even if aliphatic hydrocarbon, alicyclic hydrocarbon, aromatic hydrocarbon, and heterocycle are permuted also in no permuting, they are not cared about. A silyl radical shows silicon compound radicals, such as for example, a trimethylsilyl radical, and even if this is permuted also in no permuting, it is not cared about. A siloxanyl radical shows the silicon compound radical through ether linkage, such as for example, a trimethyl siloxanyl radical, and even if this is permuted also in no permuting, it is not cared about. Moreover, a ring structure may be formed between contiguity substituents. Even if the ring structure formed is permuted also in no permuting, it is not cared about.

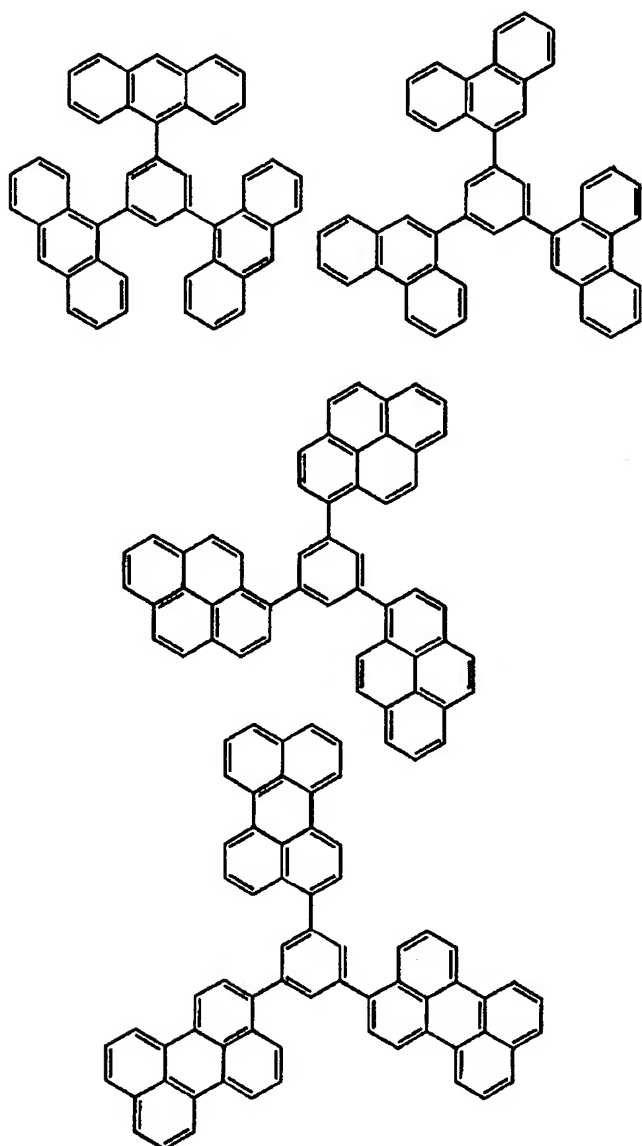
[0023] As an organic fluorescent substance which has the above-mentioned 3 permutation benzene frame, the following structures are specifically raised.

[0024]

[Formula 3]



[0025]
[Formula 4]



[0026] Although the organic fluorescent substance which has a 3 permutation benzene frame may be used as a dopant ingredient, since it has the outstanding electronic transportation ability, it is suitably used as a host ingredient.

[0027] It is not necessary to restrict the host ingredient in this invention only to an organic fluorescent substance kind which has a 3 permutation benzene frame, and the organic fluorescent substance which has two or more 3 permutation benzene frames may be mixed and used, or it may mix one or more kinds of a known host ingredient with the organic fluorescent substance which has a 3 permutation benzene frame, and may use it. The anthracene known as an emitter for some time although not limited especially as a known host ingredient, Condensed-ring derivatives, such as phenanthrene, a pyrene, perylene, and a chrysene, The metal complex of quinolinol derivatives including tris (8-quinolinolato) aluminum, A benzoxazole derivative, a stilbene derivative, a bends thiazole derivative, A thiadiazole derivative, a thiophene derivative, a tetra-phenyl butadiene derivative, Bis-styryl derivatives, such as a cyclopentadiene derivative, an OKISA diazole derivative, a bis-styryl anthracene derivative, and a JISUCHIRIRU benzene derivative, The metal complex, OKISA diazole derivative metal complex which combined a different ligand from a quinolinol derivative, By a bends azole derivative metal complex, a coumarin derivative, the pyrrolo pyridine derivative, the peri non derivative, the thiadiazolo pyridine derivative, and the polymer system, a polyphenylene vinylene derivative, a poly para-phenylene derivative, the poly thiophene derivative, etc. can be used.

[0028] Although especially the dopant ingredient added to luminescent material is not limited The phenanthrene, the anthracene which are specifically known from the former, A pyrene, tetracene, pentacene, perylene, a naphth pyrene,

dibenzopyrene, Condensed-ring derivatives, such as rubrene, a benzoxazole derivative, a benzothiazole derivative, a benzimidazole derivative, a benzotriazole derivative, an oxazole derivative, An OKISA diazole derivative, a thiazole derivative, an imidazole derivative, A thiadiazole derivative, a triazole derivative, a pyrazoline derivative, a stilbene derivative, A thiophene derivative, a tetra-phenyl butadiene derivative, a cyclopentadiene derivative, Bis-styryl derivatives, such as a bis-styryl anthracene derivative and a JISUCHIRIRU benzene derivative, A diazaindacene derivative, a furan derivative, a benzofuran derivative, phenyl iso benzofuran, Dimesityl isobenzofuran, JI (2-methylphenyl) iso benzofuran, Iso benzofuran derivatives, such as JI (2-trifluoro methylphenyl) iso benzofuran and phenyl iso benzofuran, A dibenzofuran derivative, 7-dialkylamino coumarin derivative, 7-piperidino coumarin derivative, 7-hydroxycoumarin derivative, 7-methoxy coumarin derivative, 7-acetoxy coumarin derivative, 3-benzothiazolyl coumarin derivative, 3-benzimidazolyl coumarin derivative, Coumarin derivatives, such as 3-benzoxazolyl coumarin derivative, a dicyanomethylene pyran derivative, A dicyanomethylene thiopyran derivative, a poly methine derivative, a cyanine derivative, An oxo-benzanthracene derivative, a xanthene derivative, a rhodamine derivative, A fluorescein derivative, a pyrylium derivative, a carbostyryl derivative, An acridine derivative, a bis(styryl) benzene derivative, an oxazine derivative, A phenylene oxide derivative, the Quinacridone derivative, a quinazoline derivative, A pyrrolo pyridine derivative, a furopyridine derivative, 1 and 2, a 5-thiadiazolo pyrene derivative, Although a peri non derivative, a pyrrolo pyrrole derivative, a squarylium derivative, a violanthrone derivative, a phenazine derivative, an acridone derivative, a diaza flavin derivative, etc. can use it as it is, especially an iso benzofuran derivative is used suitably.

[0029] In this invention, an electronic transportability ingredient needs to convey the electron from a negative electrode efficiently in inter-electrode [which was able to give electric field], its electron injection effectiveness is high, and it is desirable to convey the poured-in electron efficiently. For that purpose, an electron affinity is large, moreover electron mobility is large, it excels in stability further, and to be the matter which the impurity used as a trap cannot generate easily at the time of manufacture and use is demanded. It is not limited especially although there are the organic fluorescent substance which has the 3 permutation benzene frame in this invention permuted with the hydrocarbon aromatic series condensed ring including three or more ring structures as matter which fulfills such conditions, the quinolinol derivative metal complex represented by 8-hydroxy kino RINARU minium, a tropolone metal complex, a flavonol metal complex, a perylene derivative, a peri non derivative, naphthalene, a coumarin derivative, an OKISA diazole derivative, an aldazine derivative, a bis-styryl derivative, a pyrazine derivative, a phenanthroline derivative, etc. an electronic transportation ingredient which is different although it is used even when these electronic transportation ingredients are independent, and a laminating -- or it does not matter even if it mixes and uses it.

[0030] Although the ingredient used for the above electron hole transportation layer, a luminous layer, and an electronic transportation layer can form each class independently As a giant-molecule binder, a polyvinyl chloride, a polycarbonate, polystyrene, Pori (N-vinylcarbazole), polymethylmethacrylate, poly butyl methacrylate, Polyester, polysulfone, polyphenylene oxide, polybutadiene, Hydrocarbon resin, ketone resin, phenoxy resin, Pori Sall John, a polyamide, Solvent fusibility resin, such as ethyl cellulose, vinyl acetate, ABS plastics, and polyurethane resin, It is also possible to distribute hardenability resin, such as phenol resin, xylene resin, petroleum resin, a urea resin, melamine resin, an unsaturated polyester resin, alkyd resin, an epoxy resin, and silicone resin, etc., and to use.

[0031] Although especially the formation approach of photogene is not limited [coating method / resistance heating vacuum evaporation, electron beam evaporation, sputtering, a molecule laminated layers method,] in this invention, resistance heating vacuum evaporation and electron beam evaporation are usually desirable in respect of a property. Although the thickness of a layer cannot be limited since it is based also on the resistance of photogene, it is chosen from for 1-1000nm.

[0032] Although electrical energy mainly points out a direct current in this invention, it is also possible to use pulse current and alternating current. Although especially a limit does not have a current value and an electrical-potential-difference value, when the power consumption of a component and a life are taken into consideration, the brightness maximum with the lowest possible energy should be made to be obtained.

[0033] In this invention, a matrix means that by which the pixel for a display has been arranged in the shape of a grid, and displays an alphabetic character and an image by the set of a pixel. The configuration of a pixel and size are decided by the application. For example, a pixel with a square of 300 micrometers or less will be used for the image and character representation of a personal computer, a monitor, and television for one side, and, in a large-sized display

like a display panel, the pixel of mm order of one side will usually be used for them. In the case of a monochrome display, the pixel of the same color should just be arranged, but in the case of color display, the pixel of red, green, and blue is displayed side by side. In this case, there are a delta type and a stripe type typically. And as the drive approach of this matrix, either the line sequential drive approach or an active matrix is OK. Although there is an advantage that structure is simpler for the line sequential drive, since the direction of an active matrix may be excellent when an operating characteristic is taken into consideration, it is required to also use this properly by the application. [0034] The field which formed the pattern and was decided to display the information beforehand decided to be a segment type in this invention is made to emit light. For example, the operating state display of the time of day in a digital clock or a thermometer, a temperature display and audio equipment, an induction heating cooker, etc., the panel display of an automobile, etc. are raised. And said matrix display and segment display may live together in the same panel.

[0035] It is used for the purpose which raises the visibility of the indicating equipment which does not mainly carry out spontaneous light to a back light in this invention, and is used for a liquid crystal display, a clock, audio equipment, an automobile panel, the plotting board, an indicator, etc. Since the thing of the conventional method consists of a fluorescent lamp or a light guide plate, if it considers that thin-shape-izing is difficult as a back light of a personal computer application with which thin shape-ization has especially been a technical problem also in the liquid crystal display, as for the back light in this invention, a thin shape and a light weight will become the description.

[0036] [Example] This invention is not limited by these examples, although an example and the example of a comparison are given and this invention is explained hereafter.

[0037] Cutting and etching were performed for the glass substrate (the Asahi Glass Co., Ltd. make, 15ohm/**, electron-beam-evaporation article) on which 150nm of example 1ITO transparence electric conduction film was made to deposit to 30x40mm. After cleaning the obtained substrate ultrasonically for 15 minutes respectively by the acetone and the "semi-coculine 56" (product made from Fruity Chemistry), ultrapure water washed. Then, the heat methanol was made immersed for 15 minutes after cleaning ultrasonically for 15 minutes by isopropyl alcohol, and it was made to dry. Just before producing a component for this substrate, it is 1-hour UV. - It ozonized and installed in the vacuum evaporation system, and it exhausted until the degree of vacuum in equipment was set to 5×10^{-5} or less Pa. With the resistance heating method, 50nm of 4 and 4'-bis(N-(m-tolyl)-N-phenylamino) biphenyls was first vapor-deposited as an electron hole transportation ingredient. Next, as a luminescent material, the laminating of the 1, 3, and 5-tris (p-terphenyl) benzene was carried out to the thickness of 15nm. Next, as an electronic transportation ingredient, the laminating of 2, the 9-dimethyl -4, 7-diphenyl -1, and the 10-phenanthroline was carried out to the thickness of 35nm. Next, after doping a lithium to 0.5nm organic layer, 200nm of aluminum was vapor-deposited, it considered as cathode, and the component of 5x5mm angle was produced. The thickness said here is the Xtal oscillation type thickness value monitor value. Brightness, the emission spectrum, and the CIE chromaticity were measured using a luminance meter, a spectrophotofluorometer, and a color color difference meter as a luminescence property. Good blue luminescence of the luminescence wavelength of 405nm and a CIE chromaticity (0. 20 0.20) was obtained from this light emitting device. Moreover, when carrying out 1mA pulse drive (the Duty ratios 1/60, current value of 60mA at the time of a pulse) of the above-mentioned light emitting device within the vacuum cel, high brightness blue luminescence with good color purity was checked.

[0038] 1, 3, and 5-tris (2-fluorenyl) benzene was used as example 2 luminescent material, and also the light emitting device was produced completely like the example 1. Good blue luminescence of the luminescence wavelength of 429nm and a CIE chromaticity (0. 21 0.25) was obtained from this light emitting device.

[0039] 1, 3, and 5-tris (2-phenan friction mark nil) benzene was used as example 3 luminescent material, and also the light emitting device was produced completely like the example 1. Good blue luminescence of the luminescence wavelength of 517nm and a CIE chromaticity (0. 22 0.38) was obtained from this light emitting device.

[0040] Vacuum evaporatio of an example 4 electron-hole transportation ingredient was performed like the example 1. Next, using JI (2-methylphenyl) iso benzofuran (fluorescence peak wavelength being 468nm) as a dopant ingredient, vapor codeposition of the 1, 3, and 5-tris (2-fluorenyl) benzene used in the example 2 as a host ingredient was carried out to the thickness of 15nm so that a dopant might become 1wt%. Next, from vacuum evaporatio of an electronic transportation ingredient, the light emitting device was produced like the example 1. The fluorescence spectrum of a

dopant ingredient and the same emission spectrum were observed, and high brightness blue luminescence with good color purity was obtained from this light emitting device.

[0041] Pattern processing of the glass substrate (the Asahi Glass Co., Ltd. make, 15ohm/**, electron-beam-evaporation article) on which 150nm of example 5ITO transparence electric conduction film was made to deposit was carried out by cutting and the photolithography method at the shape of 300micrometer pitch (remaining width of face of 270 micrometers) x32 stripe at 30x40mm. Direction one side of a long side of an ITO stripe is extended to 1.27mm pitch (opening width of face of 800 micrometers), in order to make electrical installation with the exterior easy. After cleaning the obtained substrate ultrasonically for 15 minutes respectively by the acetone and "semi-coculine" 56, ultrapure water washed. Then, the heat methanol was made immersed for 15 minutes after cleaning ultrasonically for 15 minutes by isopropyl alcohol, and it was made to dry. Just before producing a component for this substrate, it is 1-hour UV. - It ozonized and installed in the vacuum evaporation system, and it exhausted until the degree of vacuum in equipment was set to 5×10^{-4} or less Pa. With the resistance heating method, first, as an electron hole transportation ingredient, 50nm of 4 and 4'-bis(N-(m-tolyl)-N-phenylamino) biphenyls was vapor-deposited, and 1, 3, and 5-tris (2-fluorenyl) benzene used in the example 2 was vapor-deposited in thickness of 15nm. Next, as an electronic transportation ingredient, the laminating of 2, the 9-dimethyl -4, 7-diphenyl -1, and the 10-phenanthroline was carried out to the thickness of 35nm. The thickness said here is the Xtal oscillation type thickness value monitor value. Next, mask exchange of the mask which prepared 16 250-micrometer openings (equivalent to remaining width of face of 50 micrometers and 300-micrometer pitch) in the covar plate with a thickness of 50 micrometers by wet etching was carried out so that it might intersect perpendicularly with an ITO stripe in a vacuum, and it fixed with the magnet from the rear face so that a mask and an ITO substrate might stick. And after doping a lithium to 0.5nm organic layer, 200nm of aluminum was vapor-deposited and the 32x16 dot-matrix component was produced. When carrying out the matrix drive of this component, character representation was able to be carried out without the cross talk.

[0042]

[Effect of the Invention] Luminous efficiency of this invention is high and the light emitting device excellent in color purity can be offered. It is effective especially for blue luminescence.

[Translation done.]

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